FLOOD HAZARD STUDY

DUGAN RUN

Champaign County, Ohio

Prepared by:

United States Department of Agriculture
Soil Conservation Service
Columbus, Ohio

In cooperation with:

Champaign County Commissioners
Champaign County Engineer
City of Urbana
Champaign Soil & Water Conservation District
Logan-Union-Champaign Regional Planning Commission
Top of Ohio Resource Conservation and Development Executive Council
and the
Ohio Department of Natural Resources

June 1987

FOREWARD

The contents of this report are intended to serve as a technical base for making local flood plain management decisions. The actual legal aspects of implementing a flood plain management program, however, are beyond the scope of this study.

The assistance provided by the Champaign County Engineer's office and the Urbana City Engineer's office in obtaining survey data is greatly appreciated.

The state and local units of government, as well as the general public, will benefit from the increased knowledge concerning flood hazards along Dugan Run.

Flood Hazard Study

Dugan Run

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INTRODUCTION

On October 28, 1977, a request for a flood hazard study of Dugan Run was made to the Ohio Department of Natural Resources (ODNR). The request was jointly initiated by the Champaign County Commissioners, Champaign County Engineer, City of Urbana, Champaign Soil and Water Conservation District, Logan-Union-Champaign Regional Planning Commission, and the Top of Ohio Resource Conservation and Development Executive Council. The ODNR requested the Soil Conservation Service (SCS) to carry out the technical phases of the flood hazard study.

The SCS and ODNR entered into a Joint Coordination Agreement on June 20, 1972 for the purpose of conducting flood hazard studies. Legal basis for the involvement of the ODNR is found in Sections 1501.20, 1521.04, and 1521.14 of the Ohio Revised Code. The SCS performs flood hazard studies under the authority of Section 6 of Public Law 83-566, in response to Recommendation 9(C) of House Document No. 465, 89th Congress and Executive Order 11988 dated May 24, 1977. A plan of study outlining the responsibilities of the participants, the specifics of the analysis, and the basis for funding was approved by SCS, ODNR, and the local sponsors in July, 1980.

The study sponsors have expressed their support for proper land use planning and flood plain delineation. The definition of the flood hazard areas will enable the local units of government to initiate land use and development regulations within the flood plains consistent with the identified hazards. The development of an effective flood plain management program for the study area is a main concern to the ODNR and the local sponsors. This report will provide the technical data base required to implement this program.

DESCRIPTION OF STUDY AREA

The Dugan Run Watershed comprises 20.7 square miles and is located in central Champaign County. Champaign County lies in west-central Ohio approximately 40 miles west of Columbus. The stream flows to the southwest through the City of Urbana where it joins the Mad River, a tributary of the Great Miami River. The watershed is located in the designated U.S. Water Resources Council Region 05 (Ohio River), subregion 08, and is within USGS Hydrologic Unit 05080001 (See Figure 1).

The climate of the area is marked by large annual, daily, and day to day ranges of temperature. Summers are moderately warm and humid with occasional days when temperatures exceed 100^{o}F; winters are reasonably cold and cloudy, with an average of 5 days of sub-zero temperatures. The average annual temperature is 51.7^{o}F. Weather changes occur every few days from the passing of cold or warm fronts and their associated centers of high and low pressure. Precipitation is normally abundant and well distributed throughout the year with fall being the driest season. The average annual precipitation is 37.5 inches (reference 1, 2).

Dugan Run is an intermittent stream that flows through farmland in its upper and middle reaches, and the City of Urbana in the lower reach. Most of the streambank is well vegetated with small trees, shrubs, grasses, and forbs. Approximately 1100 feet of the stream is piped through a storm sewer in Urbana. The majority of the upper and middle reaches of the stream flows through prime farmland. The cropland is primarily fall plowed, and planted to corn, soybeans, and wheat. The area provides a place for floodwaters to disperse and decrease in velocity before reaching Urbana. The lower reach of the flood plain is occupied by residential dwellings and commercial and industrial sites. The build-up restricts the flow of floodwaters and causes an increase in velocity.

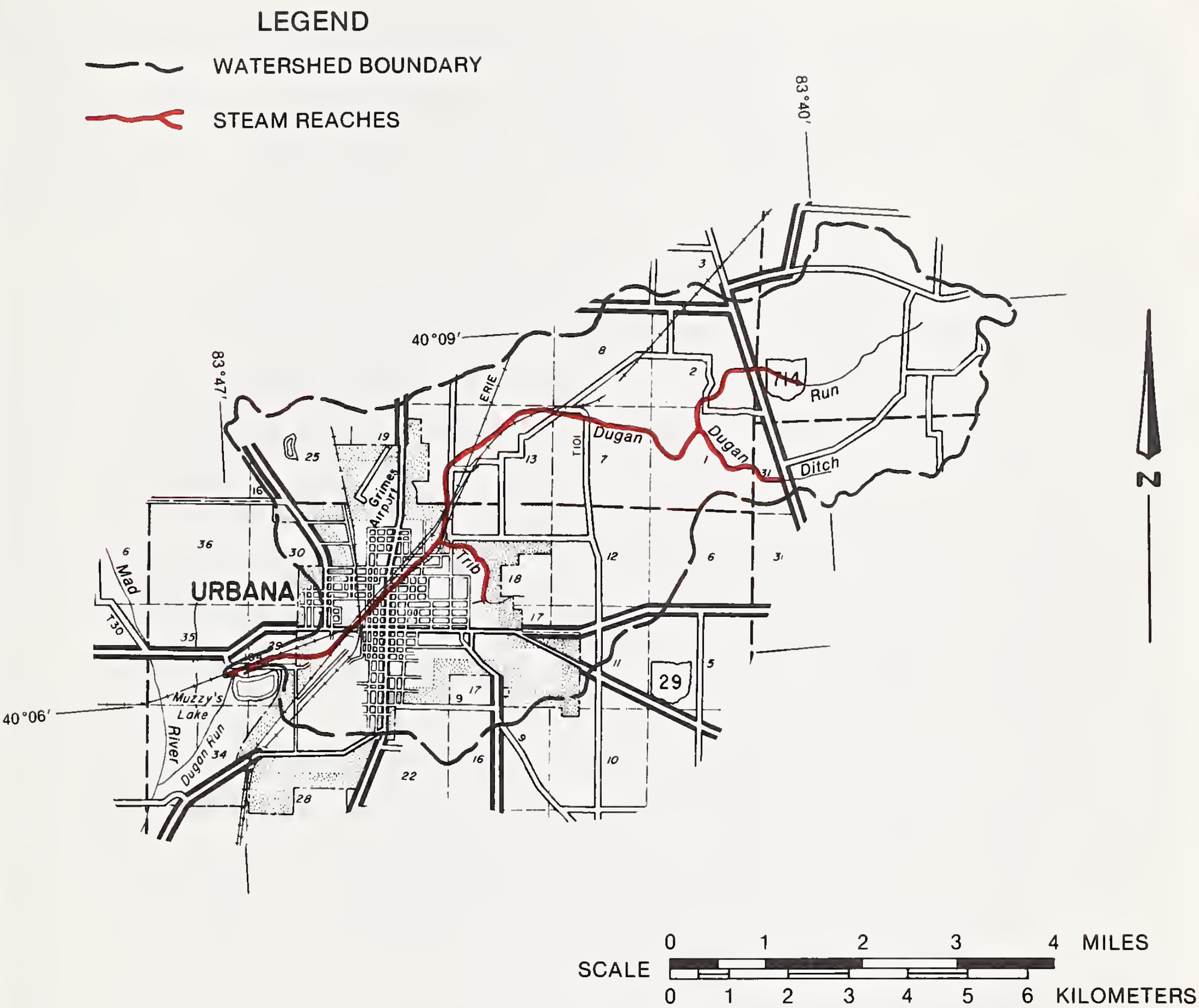
Modern agricultural practices are resulting in a decrease in wildlife habitat due to a loss of pastureland, wood lots, fencerows, and odd areas. The stream provides an environmental corridor in an area of decreasing wildlife habitat. The major wildlife species in the watershed are cottontail rabbits, fox squirrel, fox, raccoon, skunk, oppossum, deer, woodchuck, mink, muskrat, bobwhite quail, and migratory waterfowl. The stream has no reported sport fishery. The flood plain and small ponds comprise the majority of wetlands in the watershed. Recreational value is limited.

All soils in the watershed have formed in glacial till, glacial outwash, or lacustrine deposits of Wisconsin Age. The general north-south orientation of the major soil areas is closely related to the advances and retreats of the glacier. Dugan Run from its headwaters to its mouth dissects a number of these soil associations ranging from the steep, well drained uplands to level, very poorly drained soils on old glacial lakebeds (reference 3).

This study includes 10.1 stream miles along Dugan Run, Dugan Ditch, and an unnamed tributary in Urbana (see Table 1). The land use upstream of Urbana is agricultural with scattered single family residences. Most of the development in the watershed has occurred in the fringe area around Urbana.

Table 1: Study Limits

Stream	from	to	Stream Length -miles-
Dugan Run	500' downstream of Muzzys Road	3,000' upstream of S.R. 714	8.1
Dugan Ditch	Confluence with Dugan Run	S.R. 714	1.2
tributary	East Lawn Avenue	Washington Avenue	0.8
		Total	= 10.1



OHIO

FLOOD HAZARD STUDY AREA
VICINITY MAP
DUGAN RUN
CHAMPAIGN COUNTY, OHIO

SOURCE:
1979 GENERAL COUNTY HIGHWAY MAP AND
INFORMATION FROM SCS FIELD PERSONNEL

USDA-SCS-LINCOLN, NEBR 1982

MARCH 1982

FLOOD PROBLEMS

Major floods in this area normally occur during the winter and spring months. During these months runoff is accelerated by snow melt and frozen ground conditions. Ice jams at bridges and culverts also aggravate upstream flooding.

There are no stream gages located in the watershed, however, a gage located on the Mad River approximately 2 miles west of Urbana gives an indication of the recorded flood history of the area. During the 42 years of record at this gage the maximum known discharge occurred in January 1959, with a recurrence interval of approximately 65 years (reference 4). This level of flooding was approached very closely in February 1929 and also in March 1963 (reference 5). Although no records are available at this location prior to 1926 it is generally accepted that the flood of March 1913 exceeded all known floods. A local newspaper (reference 6) reported on March 25, 1913 that "Dugan Ditch overflowed and the Erie and Pennsylvania tracks were submerged from North Main Street to the west side of Urbana." Flooding extended to the second block of East Market Street and on the west to Oakland Street. During this period of March 23-27, 1913, 8.66 inches of rainfall was recorded at Urbana (reference 7).

Potential flood areas exist along all the streams as outlined in this report, however, the primary flood damage area in the watershed is through the city of Urbana. Flooding of streets, intersections, and basements occurs annually.

Storm runoff from the hilly upland areas east of State Route 714 concentrates in a natural storage basin between State Route 714 and Dugan Road to the west. This area is characterized by level, very poorly drained soils on an old glacial lakebed (reference 3). Floodwaters spread out over this cropland area dissipating the magnitude of peak discharges downstream. Proceeding downstream in the watershed through Urbana to the mouth of Dugan Run peak discharges again increase in magnitude.

Some inconsistencies in bridge and culvert sizes exist throughout the area of Urbana. Bridge and culvert capacities vary considerably within Urbana for approximately the same drainage area and discharge.

The projected changes in land use and cover conditions anticipated in the next 10 to 15 years were used to estimate future peak flood discharges. The resultant change in flood elevations was found to be insignificant in all areas of the watershed.

The total area flooded by the 100-year flood within the study area is 1,177 acres (See Table 2).

Table 2: 100-Year Flood Plain Area (Acres)

Stream	Agricultural Land	Urban Land
Dugan Run	859	174
Dugan Ditch	112	0
tributary	30	2
	1,001	176

Total Floodplain Area = 1,177 acres

The exhibits in this report include flood hazard area photomosaics and index, water surface profiles, tables containing water surface elevations at each cross section and bridge, floodway information, and benchmark elevations.

The photomosaics (Appendix A) are photographs put together to form the desired photographic coverage of the stream reach being studied. These maps include the location of cross sections, known landmarks, benchmarks, and the area bound by the theoretical floodway and the 100-year flood. The determination of the flood boundary lines in Appendix A is based upon existing topographic data. For specific site evaluations, it is recommended that field elevations be compared directly to flood profile elevations in Appendix B.

Flooding at Intersection of East Lawn Avenue and Children's Home Road February 3, 1982

Flooding Along State Route 714 February 3, 1982

Figure 2: Past Flooding

Appendices C-2, C-3, and the water surface profiles in Appendix B contain the same information but in a different form. The elevations of the 10, 50, 100, and 500-year floods can be read directly from Appendix C for the desired cross section. Appendix C-2 is for valley sections while Appendix C-3 is for bridge sections. Appendix C-3 contains detailed information pertinent to the hydraulic design of bridges. The calculated water surface profiles do not include the effects of ice and/or debris plugged bridges, and due to these conditions actual flood elevations may be higher than shown.

The plotted water surface profiles in Appendix B show the location of cross sections and roads crossing the streams and the elevation of the water surface for the 10, 50, 100, and 500-year floods. The water surface elevation at a particular location can be found by: (1) locating the point in question on the photomosaics (Appendix A); (2) measuring the distance along the stream to the nearest cross section; (3) locating the selected cross section along the profile in Appendix B; and (4) measuring the same distance horizontally to the desired point. The water surface elevation can then be read from the vertical scale.

Appendix C-4 contains floodway data for each cross section consisting of profile station, width, area, mean velocity, and water surface elevation. Floodway widths were determined by reducing amounts of conveyance equally from both sides of the valley until the water surface was increased one foot above the 100-year flood elevation.

A complete program for reducing flood damages must incorporate preventive as well as corrective measures. Historically, we have relied upon corrective measures such as dams, levees, channel improvement, and flood proofing to provide some degree of flood damage reduction. Despite continuing nationwide expenditures, annual flood losses are increasing. This can be attributed directly to man's industrial, residential, and commercial encroachment upon the flood plains. Although structural measures have and will continue to play an important role in reducing flood damages, a more comprehensive approach including prevention of possible future flood losses is needed.

Preventive measures may include varying degrees of regulatory controls (nonstructural measures). In the State of Ohio, local units of government have the exclusive responsibility for controlling land use. Therefore, the counties, townships, and/or municipalities must take the initiative to enact the necessary regulations to control flood plain development. The Ohio Department of Natural Resources is available to provide assistance to local communities for developing a floodplain management program.

Tools to avoid or minimize flood losses may include the following:

a. Zoning - Floodplain zoning regulations can be used to control what uses are made of the floodplain, what specific activities or developments can take place, and how these activities or developments can be conducted. Floodplain zoning is the most widely used regulatory tool and the one with the broadest application. It can assure that the floodplain is maintained for its natural function.

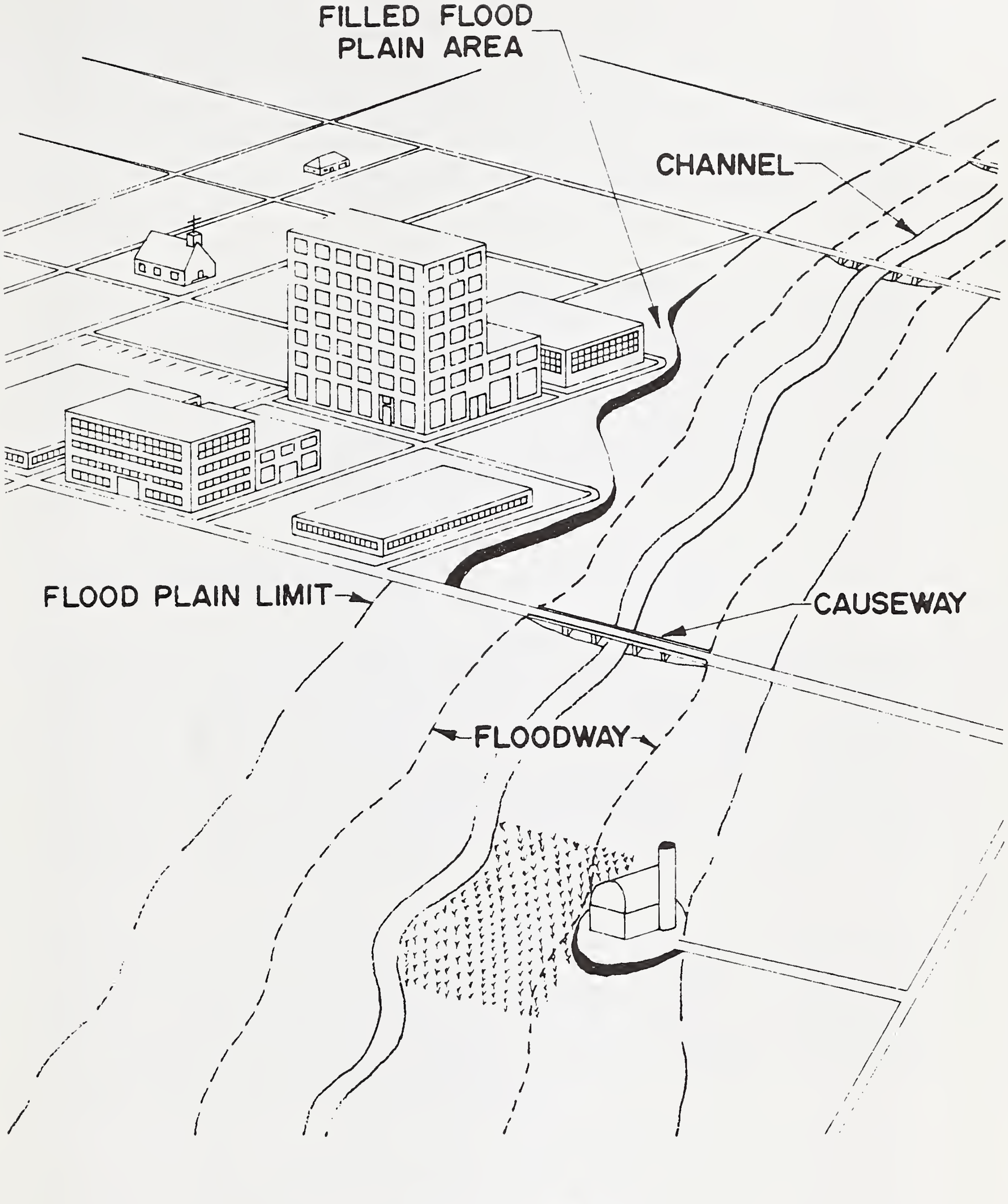
b. Subdivision Regulations - Subdivision regulations offer a very useful device for controlling floodplain use in areas not yet developed. They may require that the floodplain areas be clearly identified on the plat map, which would serve as a warning of the flooding potential of the vacant land to prospective land buyers.

The basic authority for municipalities to use subdivision regulations stems from Article XVIII, Section 3, of the Ohio Constitution, which is frequently called the "homerule" clause. County use of subdivision regulations is an extension of state regulatory powers. Specification of the powers of municipal and county governments and of the procedures to be followed is found in the Ohio Revised Code, Sections 711.001 to 735.26. One limitation on the use of subdivision regulations for controlling the use of floodplain lands is that these regulations are effective only when utilized before land is developed. A second constraint is that these regulations are applicable only to subdivisions where lot size is limited to a maximum of five acres, unless new streets or easements of access are involved. Thirdly, use of subdivision regulations to control use of floodplain lands may not withstand challenges in court if the enabling language of a planning commission is not explicit in identifying flood loss prevention as an appropriate criterion for formulating subdivision regulations.

c. Other Regulatory Tools - Building and housing codes, sanitary codes and other special regulations can be enacted at the local level to help preserve the flood convenance capacity of floodplains. Floodplain regulations also help to achieve broader community objectives such as preservation of wildlife, scenic beauty, and open space.

Floodway

The regulatory floodway is not an actual channel, rather it is the equivalent area required to convey the 100-year flood without increasing flood heights more than 1.0 foot. The area between the 100-year floodplain boundary and the floodway (flood fringe) may be filled to above the 100-year flood elevation and developed, however, the floodway itself must remain in an open condition.



PERSPECTIVE VIEW OF A
FLOOD PLAIN AND FLOODWAY

Figure 3

Preliminary floodway delineations contained in this report may be used for setting up zoning boundaries and/or regulations controlling land use in the floodplain. The Ohio Department of Natural Resources recommends that if the floodplain is filled, the fill will be at an elevation of 1.5 feet above the 100-year flood elevation. Fill inside the floodway boundary is not permitted.

Another purpose of the floodway is to identify that part of the floodplain where potential damage is the greatest, i.e., the velocity and depth of flooding are greatest. Floodway data are tabulated for each cross section and for the purpose of floodplain management, include distances to the right and left (looking downstream) of the centerline of the stream channel. These distances represent encroachment limits on each side of the floodplain.

National Flood Insurance Program

Flood insurance can be used to modify the impact of flooding on individuals and the community. Insurance is a means for spreading the cost of losses over time and over a large number of risks. Under the National Flood Insurance Program, the government subsidizes flood insurance for existing property in return for enactment and enforcement of floodplain management regulations designed to reduce future losses and prevent development in flood prone areas.

Both the city of Urbana and the unincorporated areas of Champaign County are participating in the emergency phase of the program. The emergency program is normally the entry phase for Ohio communities. At this stage, flood insurance is available throughout the entire community at flat rates without regard to the local flood hazards.

The detailed hydrologic and hydraulic calculations contained in this flood hazard analysis can be used by the Federal Emergency Management Agency to conduct a detailed flood rate study. This would allow the community to enter into the regular phase of the program. Insurance rate zones would be established and policy premiums would be based on the actual flood risk for that particular section of the stream.

Recommendations

1. It is hoped that this report will provide the information necessary to help reduce the area's susceptibility to flood damage. By quantifying the flood areas and flood elevations, regulations can be imposed to prevent unwise development in flood prone areas. It is recommended that the information in this report be incorporated into local zoning regulations, building codes, or other regulations as appropriate.

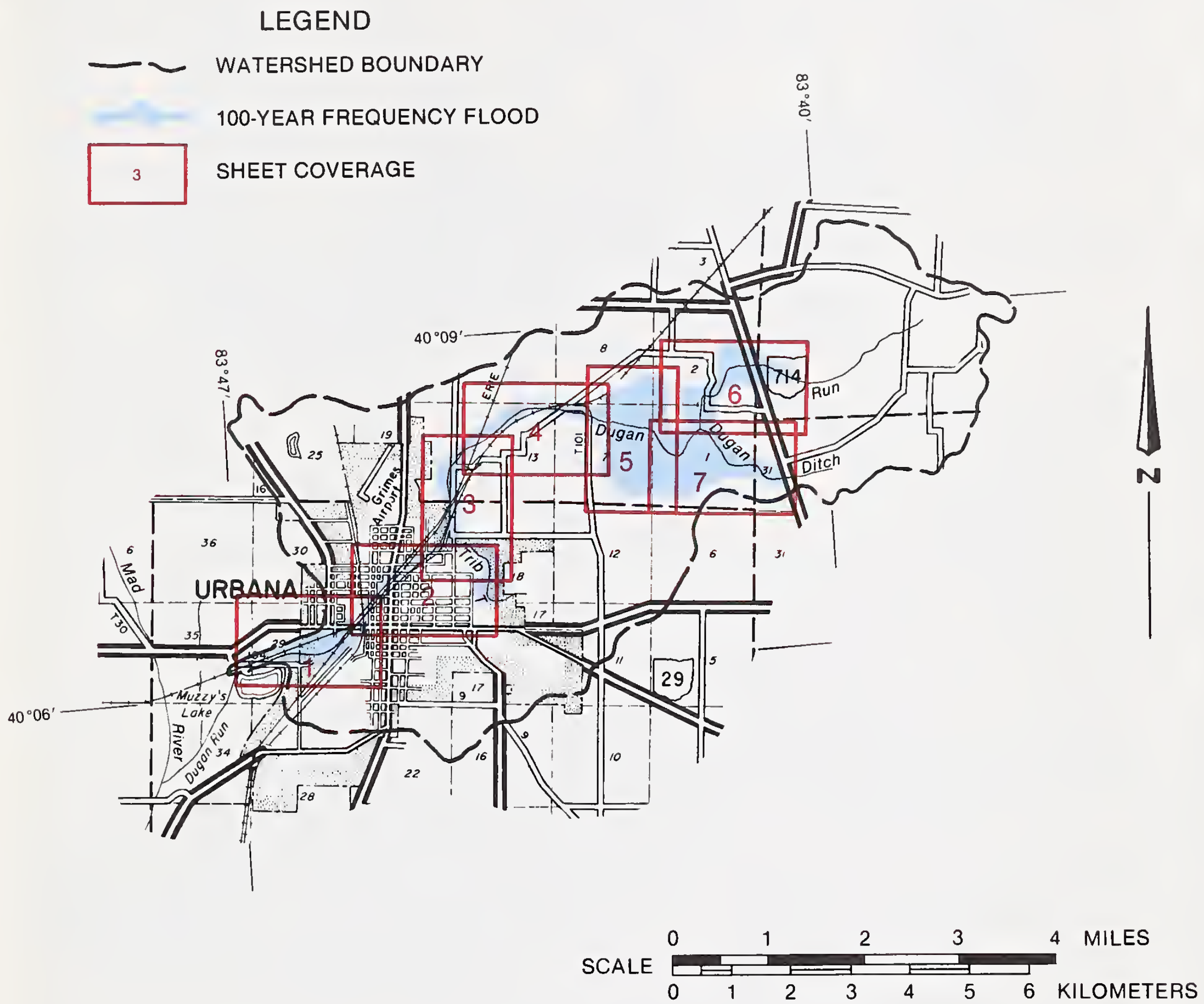
2. Continued participation in the National Flood Insurance Program is encouraged. This program emphasizes flood plain management and, in the long term, discourages unwise construction in the flood plain.

APPENDIX A

Index and Flood Hazard Area Photomosaics

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



OHIO

FLOOD HAZARD STUDY AREA MOSAIC SHEET INDEX MAP

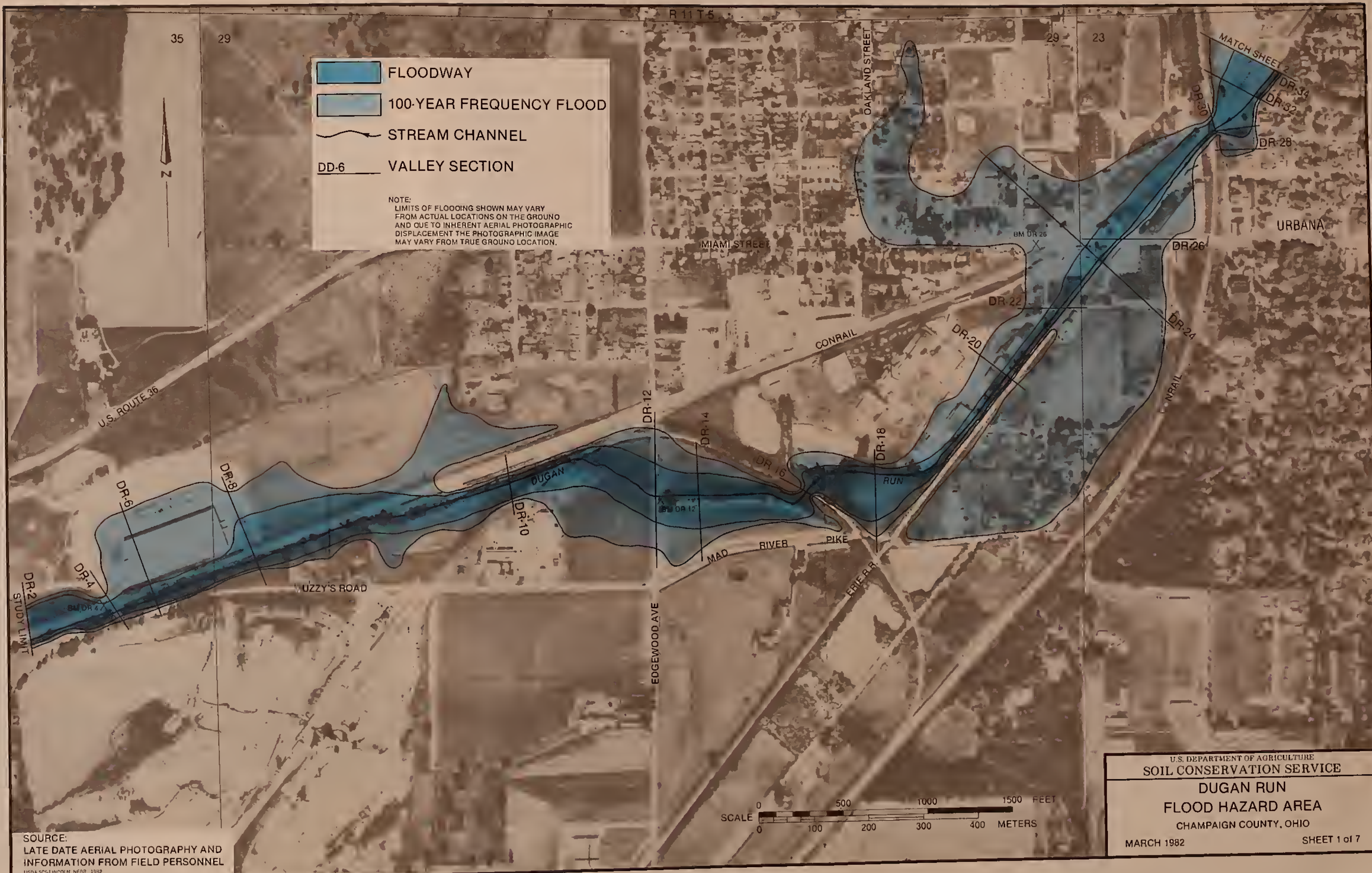
DUGAN RUN

CHAMPAIGN COUNTY, OHIO

SOURCE:
1979 GENERAL COUNTY HIGHWAY MAP AND
INFORMATION FROM SCS FIELD PERSONNEL

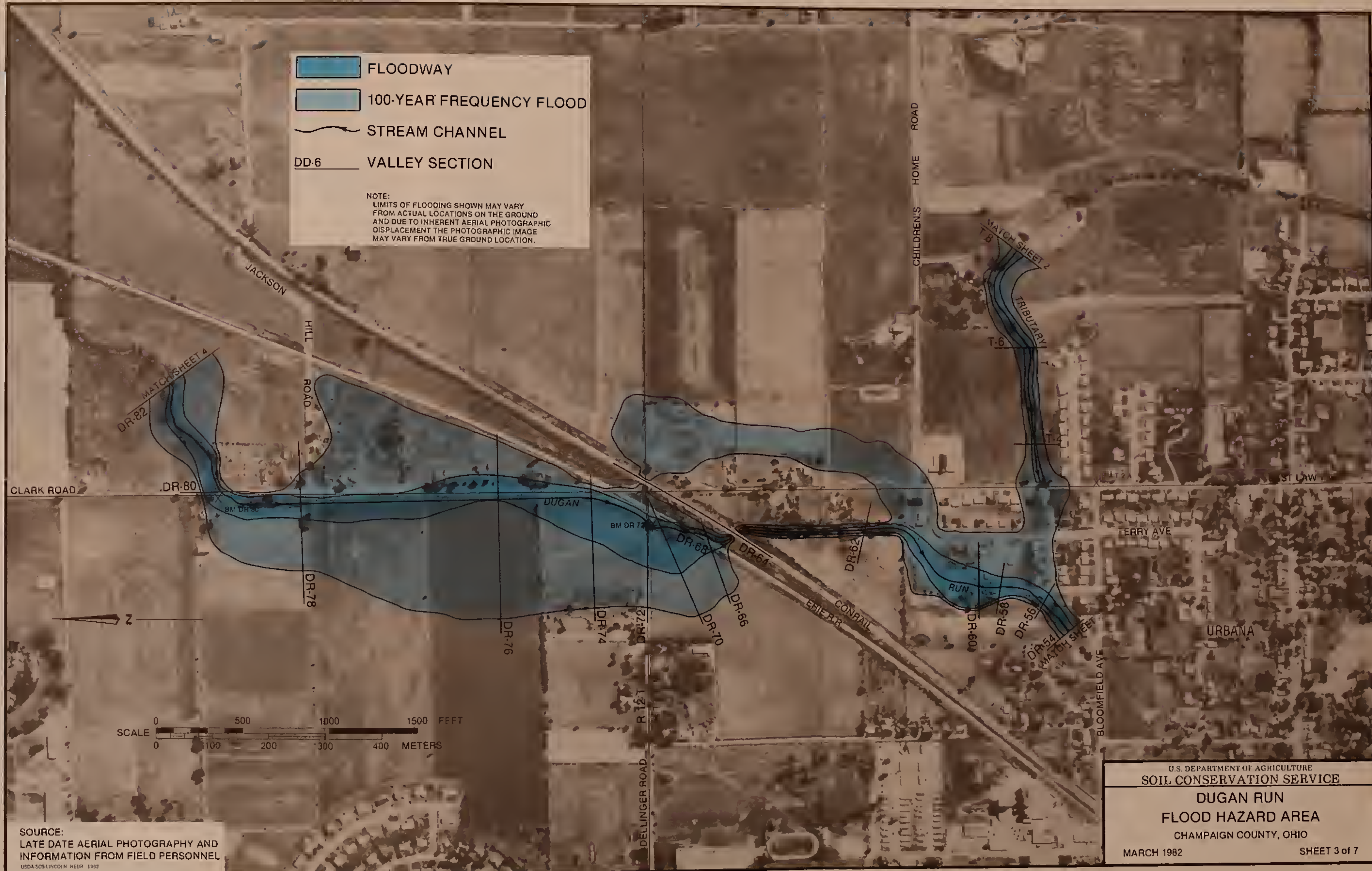
USDA-SCS-LINCOLN, NEBR 1982

MARCH 1982



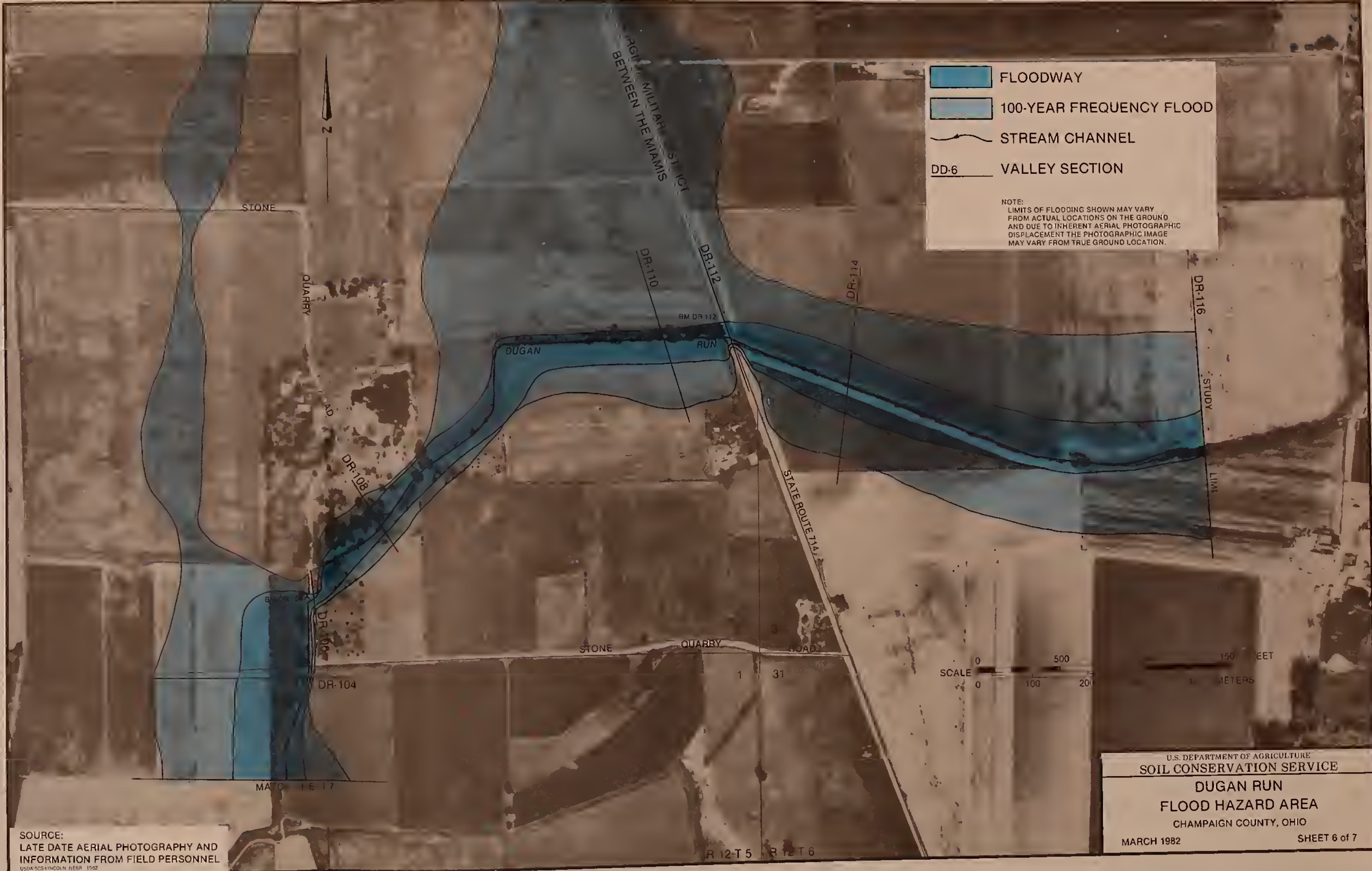
R 11 T 5
35
29
29
23
FLOODWAY
100-YEAR FREQUENCY FLOOD
STREAM CHANNEL
DD-6 VALLEY SECTION
NOTE:
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION.
N
MATCH SHEET 2
OAKLAND STREET
MIAMI STREET
URBANA
BM DR 26
DR-34
DR-32
DR-30
DR-28
DR-26
DR-24
DR-22
DR-20
DR-18
DR-16
DR-14
DR-12
DR-10
DR-8
DR-6
DR-4
DR-2
STUDY LIMIT
BM DR 4
BM DR 12
CONRAIL
NRAIL
U.S. ROUTE 36
DUGAN
RUN
MAD RIVER PIKE
UZZY'S ROAD
EDGEWOOD AVE
ERIE R.R.
SCALE 0 500 1000 1500 FEET
0 100 200 300 400 METERS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DUGAN RUN
FLOOD HAZARD AREA
CHAMPAIGN COUNTY, OHIO
MARCH 1982
SHEET 1 of 7
SOURCE:
LATE DATE AERIAL PHOTOGRAPHY AND INFORMATION FROM FIELD PERSONNEL
USDA SCS-LINCOLN, NEBR 1982


FLOODWAY
100-YEAR FREQUENCY FLOOD
STREAM CHANNEL
DD-6 VALLEY SECTION
NOTE:
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION.
R 11 T 5
NORTH MAIN STREET
CONRAIL
MATCH SHEET 3
DR-54
DR-52
DR-50
DR-48
DR-46
BM DR 48
BLOOMFIELD AVE
EAST LAWN AVE
LIGHT STREET
JULIA STREET
BOYCE STREET
DR-44
DR-42
DR-40
DR-38
BM DR 38
DR-36
DR-34
MATCH SHEET 1
DUGAN RUN
URBANA
MATCH SHEET 3
T-8
T-10
BM T 10 A
T-12
T-14
T-16
STUDY LIMIT
TRIBUTARY 1
CONRAIL
30
24
29
23
24
18
23
17
MIAMI STREET
SCALE
0 500 1000 1500 FEET
0 100 200 300 400 METERS
SOURCE:
LATE DATE AERIAL PHOTOGRAPHY AND INFORMATION FROM FIELD PERSONNEL
USDA SCS-LINCOLN NEBR 1982
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DUGAN RUN
FLOOD HAZARD AREA
CHAMPAIGN COUNTY, OHIO
MARCH 1982
SHEET 2 of 7


FLOODWAY
100-YEAR FREQUENCY FLOOD
STREAM CHANNEL
DD-6 VALLEY SECTION
NOTE:
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION.
JACKSON
HILL ROAD
CHILDREN'S HOME ROAD
MATCH SHEET 4
MATCH SHEET 2
MATCH SHEET
TRIBUTARY
T-8
T-6
DR-82
DR-80
CLARK ROAD
BM DR 80
DUGAN
RUN
BM DR 72
DR-78
DR-76
DR-74
DR-72
DR-70
DR-68
DR-66
DR-64
DR-62
DR-60
DR-58
DR-56
DR-54
CONRAIL
ERIE R.R.
TERRY AVE
BLOOMFIELD AVE
URBANA
DELLINGER ROAD
N
SCALE
0 500 1000 1500 FEET
0 100 200 300 400 METERS
SOURCE:
LATE DATE AERIAL PHOTOGRAPHY AND INFORMATION FROM FIELD PERSONNEL
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DUGAN RUN
FLOOD HAZARD AREA
CHAMPAIGN COUNTY, OHIO
MARCH 1982
SHEET 3 of 7

JACKSON HILL ROAD
DR-82
DR-84
DR 85
DR-86
DR-88
DR-90
DR-92
DR-98
DR-100
MATCH SHEET 3
MATCH SHEET 5
ERIE R.R.
DUGAN ROAD
14
8
N
FLOODWAY
100-YEAR FREQUENCY FLOOD
STREAM CHANNEL
DD-6
VALLEY SECTION
NOTE:
LIMITS OF FLOODING SHOWN MAY VARY
FROM ACTUAL LOCATIONS ON THE GROUND
AND DUE TO INHERENT AERIAL PHOTOGRAPHIC
DISPLACEMENT THE PHOTOGRAPHIC IMAGE
MAY VARY FROM TRUE GROUND LOCATION.
SCALE
0
500
1000
1500
FEET
0
100
200
300
400
METERS
SOURCE:
LATE DATE AERIAL PHOTOGRAPHY AND
INFORMATION FROM FIELD PERSONNEL
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DUGAN RUN
FLOOD HAZARD AREA
CHAMPAIGN COUNTY, OHIO
MARCH 1982
SHEET 4 of 7

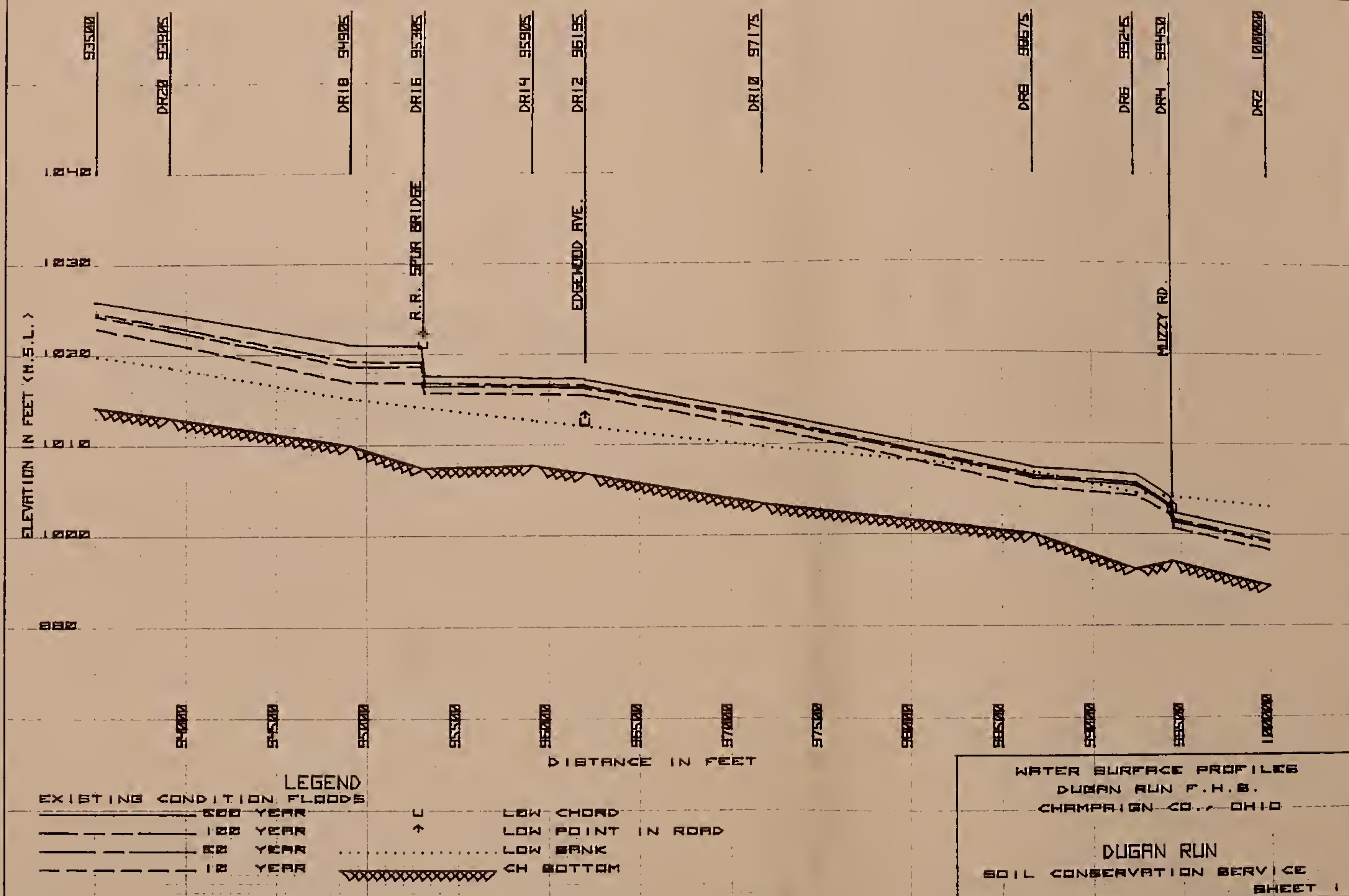

SCALE
0 500 1000 1500 FEET
0 100 200 300 400 METERS
MATCH SHEET 7
DR-102
R 12 T 5
2
1
8
7
1
6
7
12
N
RUN
DUGAN
CONRAIL
JACKSON HILL ROAD
DR-100
MATCH SHEET 4
DUGAN ROAD
FLOODWAY
100-YEAR FREQUENCY FLOOD
STREAM CHANNEL
DD-6
VALLEY SECTION
NOTE:
LIMITS OF FLOODING SHOWN MAY VARY
FROM ACTUAL LOCATIONS ON THE GROUND
AND DUE TO INHERENT AERIAL PHOTOGRAPHIC
DISPLACEMENT THE PHOTOGRAPHIC IMAGE
MAY VARY FROM TRUE GROUND LOCATION.
SOURCE:
LATE D
INFORMATION FROM FIELD PERSONNEL
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DUGAN RUN
FLOOD HAZARD AREA
CHAMPAIGN COUNTY, OHIO
MARCH 1982
SHEET 5 of 7


FLOODWAY
100-YEAR FREQUENCY FLOOD
STREAM CHANNEL
DD-6
VALLEY SECTION
NOTE:
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION.
N
BETWEEN THE MIAMIS
STONE
QUARRY
DR-110
DR-112
DR-114
DR-116
BM DR 112
DUGAN
RUN
STUDY
LIMI
DR-108
STATE ROUTE 714
DR-104
STONE
QUARRY
ROAD
1
31
SCALE
0
500
0
100
METERS
R 12-T 5
R 12 T 6
SOURCE:
LATE DATE AERIAL PHOTOGRAPHY AND INFORMATION FROM FIELD PERSONNEL
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DUGAN RUN
FLOOD HAZARD AREA
CHAMPAIGN COUNTY, OHIO
MARCH 1982
SHEET 6 of 7


MATCH SHEET 6
N
FLOODWAY
100-YEAR FREQUENCY FLOOD
STREAM CHANNEL
DD-6
VALLEY SECTION
NOTE:
LIMITS OF FLOODING SHOWN MAY VARY
FROM ACTUAL LOCATIONS ON THE GROUND
AND DUE TO INHERENT AERIAL PHOTOGRAPHIC
DISPLACEMENT THE PHOTOGRAPHIC IMAGE
MAY VARY FROM TRUE GROUND LOCATION.
STATE ROUTE 71A
DUGAN
DD-2
DUGAN
MATCH SHEET 5
DR-3
DD-4
SWISHER ROAD
DR-102
STUDY LIMIT
BM DD 6
SCALE
0 500 1000 1500 FEET
0 100 200 300 400 METERS
R 12 T 5
31
R 12 T 6
36
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
DUGAN RUN
FLOOD HAZARD AREA
CHAMPAIGN COUNTY, OHIO
MARCH 1982
SHEET 7 of 7
SOURCE:
LATE DATE AERIAL PHOTOGRAPHY AND
INFORMATION FROM FIELD PERSONNEL
USDA SCS LINCOLN, NEBR 1982

APPENDIX B

Flood Profiles



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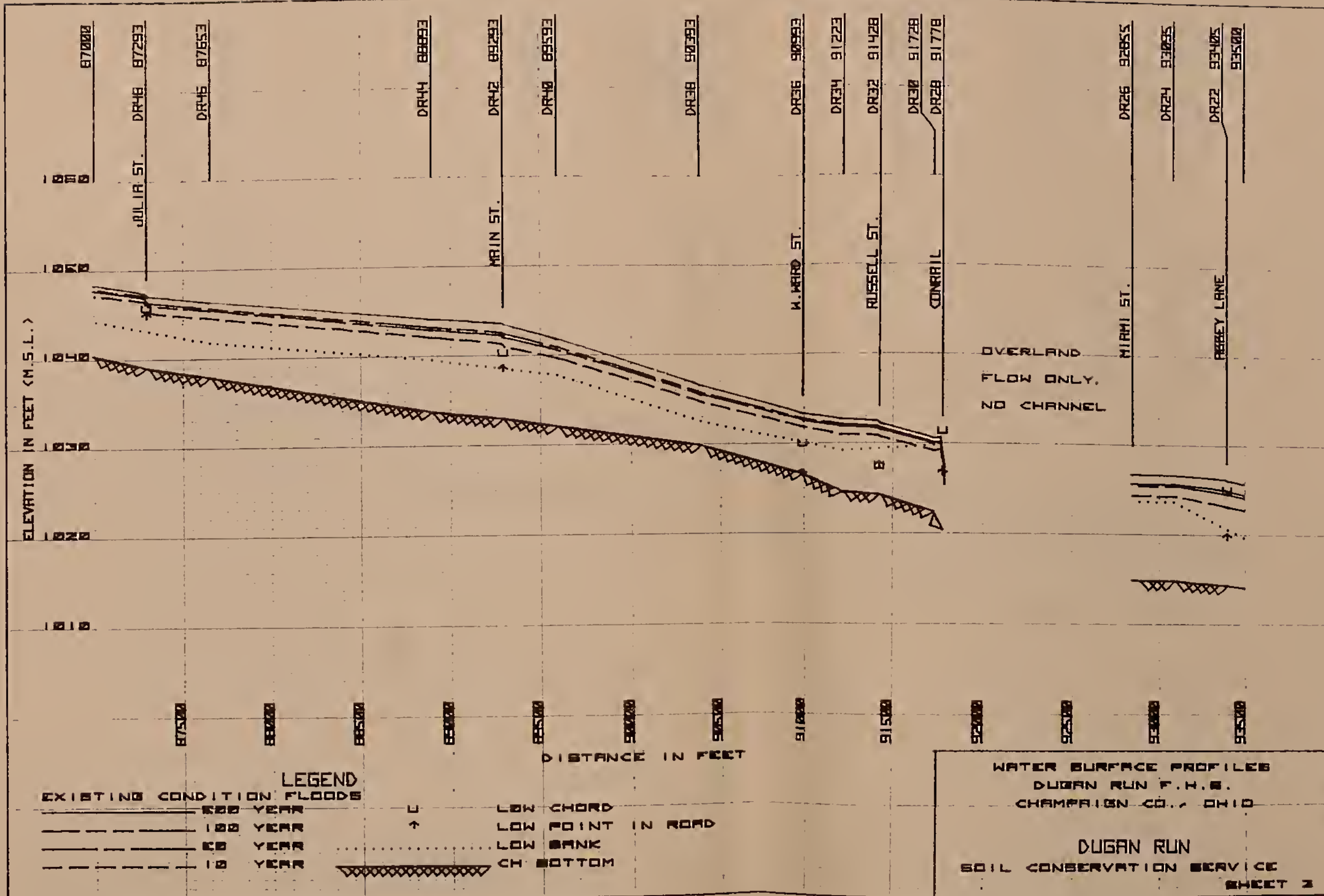
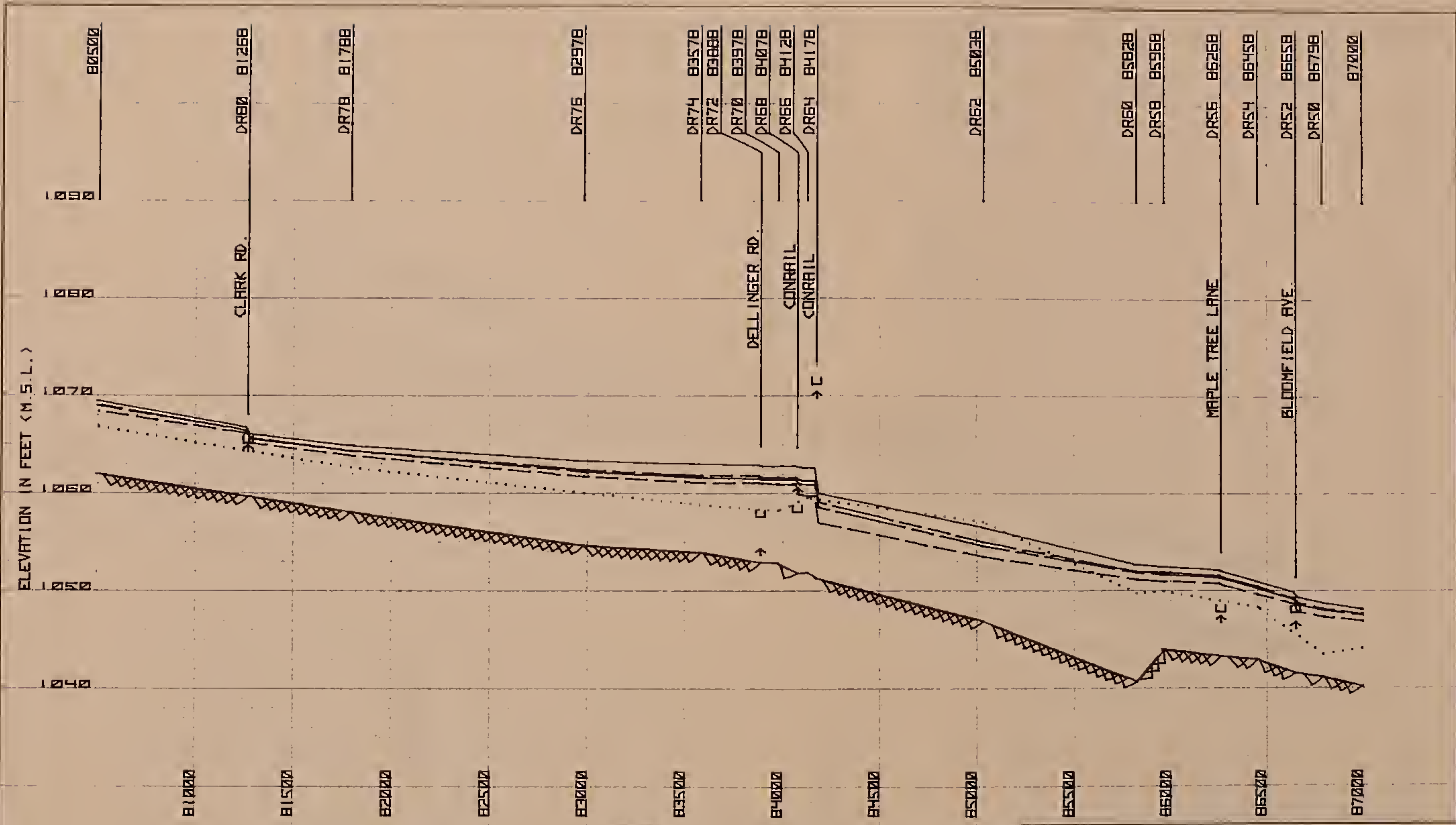
DR18 94905
DR16 95305
DR14 95905
DR12 96195
DR10 97175
DR8 98675
DR6 99245
DR4 99450
DR2 100000
R.R. SPUR BRIDGE
EDGEWOOD AVE.
MUZZY RD.
1040
1030
1020
1010
1000
990
ELEVATION IN FEET (M.S.L.)
94000
94500
95000
95500
96000
96500
97000
97500
98000
98500
99000
99500
100000
DISTANCE IN FEET
LEGEND
EXISTING CONDITION FLOODS
500 YEAR
100 YEAR
50 YEAR
10 YEAR
LOW CHORD
LOW POINT IN ROAD
LOW BANK
CH BOTTOM
WATER SURFACE PROFILES
DUGAN RUN F.H.S.
CHAMPAIGN CO., OHIO
DUGAN RUN
SOIL CONSERVATION SERVICE
SHEET 1



87000
DR48 87293
DR46 87653
DR44 88893
DR42 89293
DR40 89593
DR38 90393
DR36 90993
DR34 91223
DR32 91428
DR30 91728
DR28 91778
DR26 92855
DR24 93035
DR22 93405
93500
JULIA ST.
MAIN ST.
W.WARD ST.
RUSSELL ST.
CONRAIL
MIAMI ST.
ABBEY LANE
OVERLAND
FLOW ONLY,
NO CHANNEL
ELEVATION IN FEET (M.S.L.)
1060
1050
1040
1030
1020
1010
87500
88000
88500
89000
89500
90000
90500
91000
91500
92000
92500
93000
93500
DISTANCE IN FEET
LEGEND
EXISTING CONDITION FLOODS
500 YEAR
100 YEAR
50 YEAR
10 YEAR
LOW CHORD
LOW POINT IN ROAD
LOW BANK
CH BOTTOM
WATER SURFACE PROFILES
DUGAN RUN F.H.S.
CHAMPAIGN CO., OHIO
DUGAN RUN
SOIL CONSERVATION SERVICE
SHEET 3



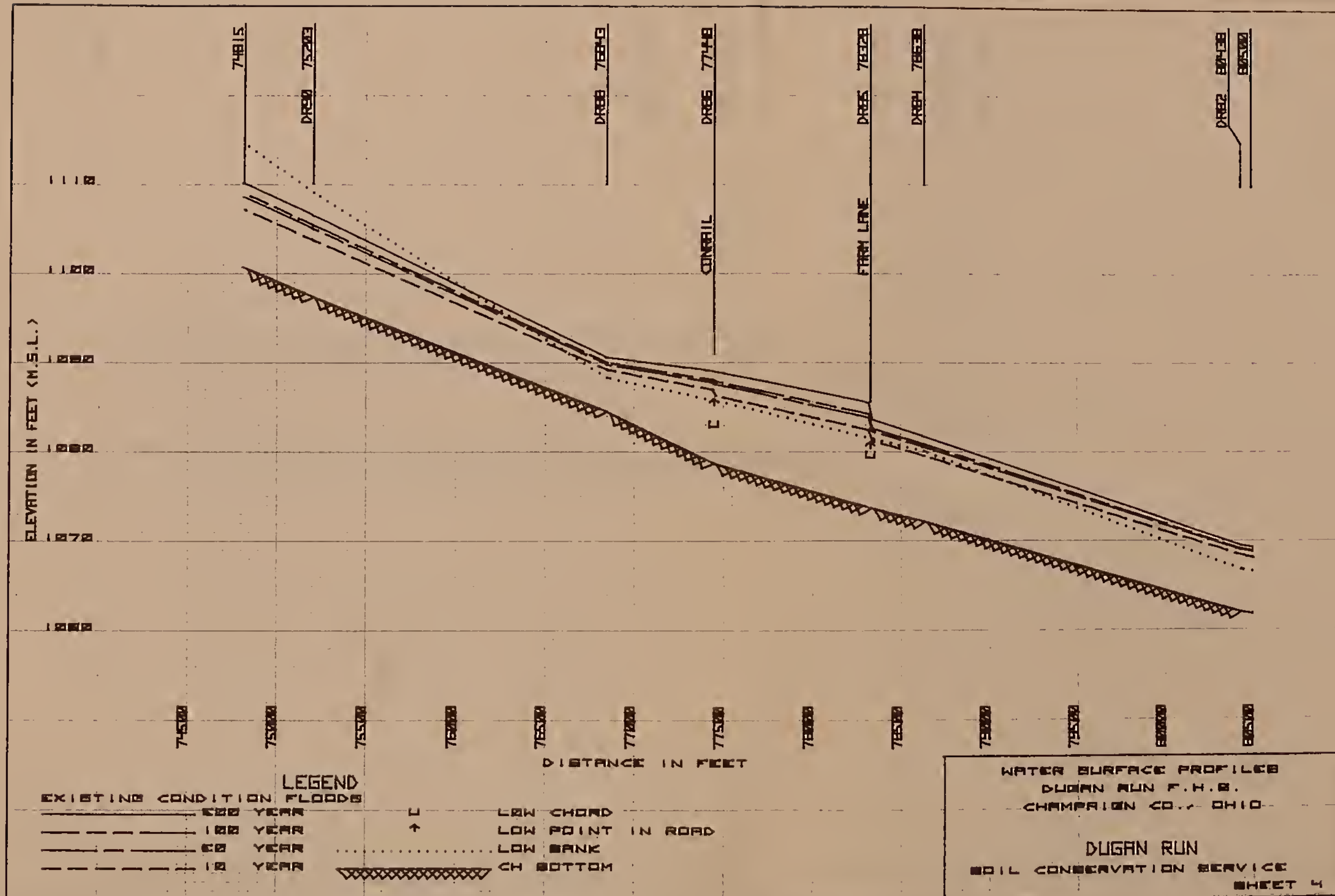
LEGEND

EXISTING CONDITION FLOODS

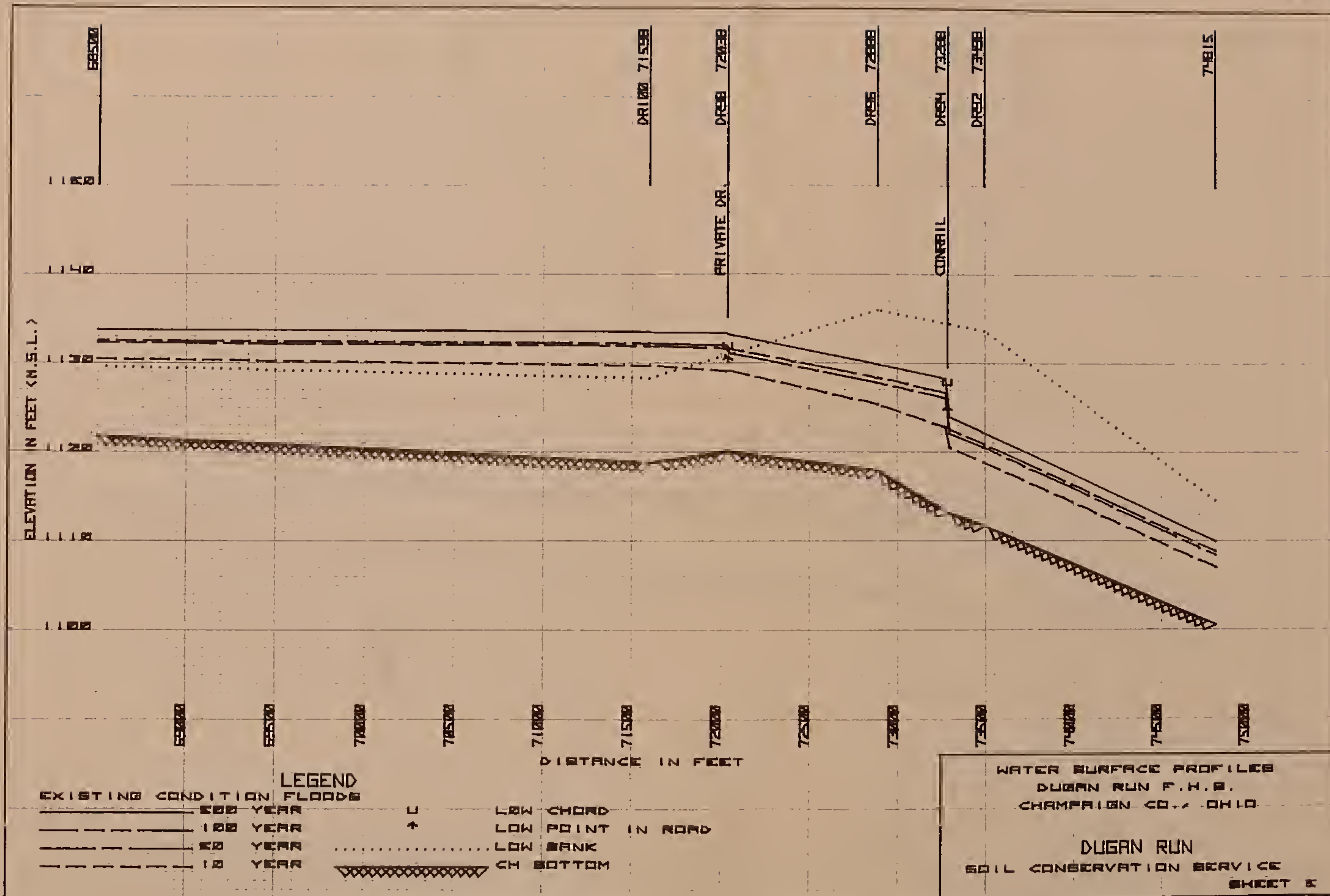
————	500 YEAR	⊔	LOW CHORD
— — — ——	100 YEAR	↑	LOW POINT IN ROAD
—— — ——	50 YEAR	······	LOW BANK
— — — — —	10 YEAR	✕✕✕✕✕	CH BOTTOM

WATER SURFACE PROFILES
DUGAN RUN F.H.S.
CHAMPAIGN CO., OHIO

DUGAN RUN
SOIL CONSERVATION SERVICE
SHEET 3

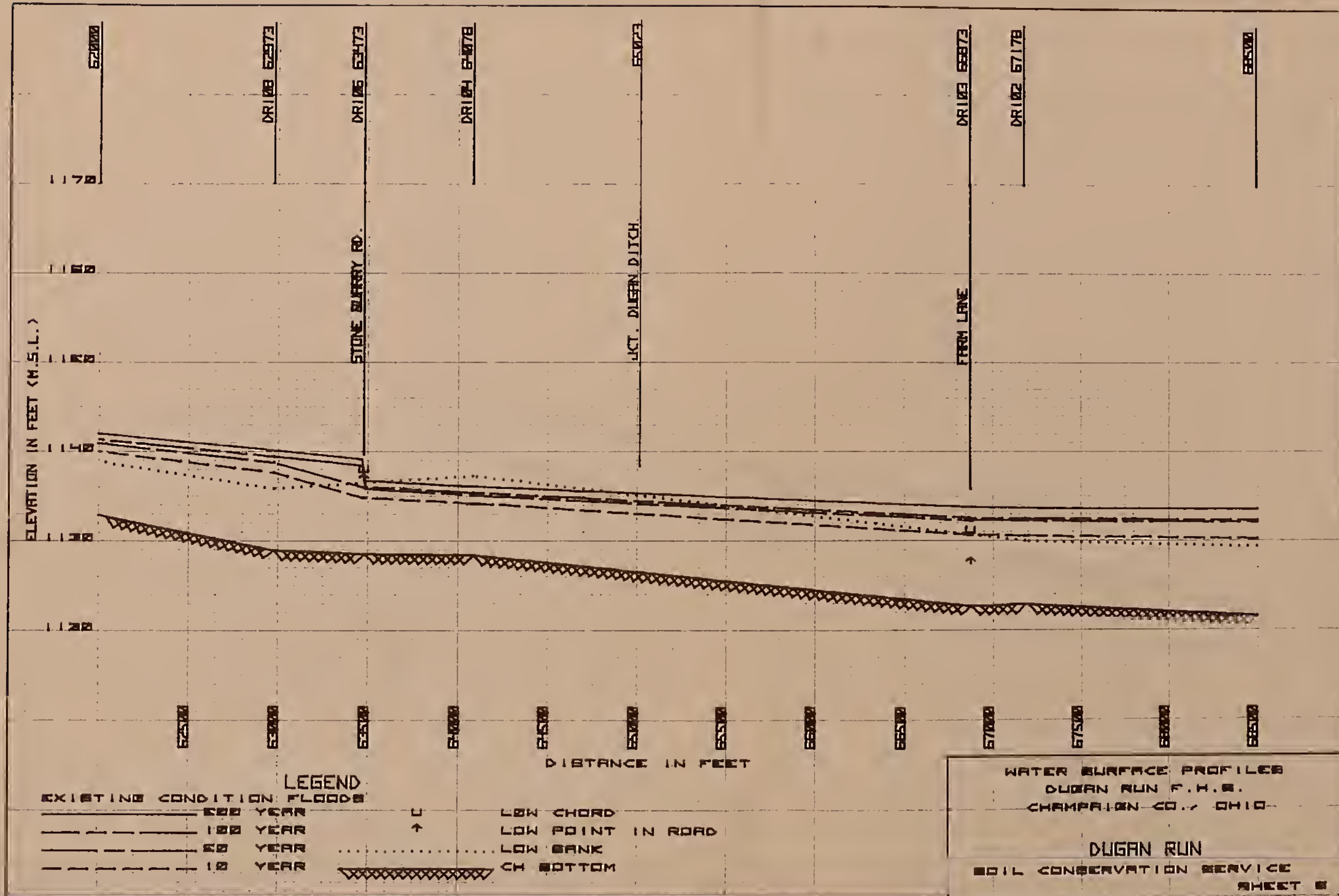


74815
75203
76843
77448
78328
78638
80438
80500
CONRAIL
FARM LANE
1110
1100
1090
1080
1070
1060
ELEVATION IN FEET (M.S.L.)
74500
75000
75500
76000
76500
77000
77500
78000
78500
79000
79500
80000
80500
DISTANCE IN FEET
LEGEND
EXISTING CONDITION FLOODS
500 YEAR
100 YEAR
50 YEAR
10 YEAR
LOW CHORD
LOW POINT IN ROAD
LOW BANK
CH BOTTOM
WATER SURFACE PROFILES
DUGAN RUN F.H.S.
CHAMPAIGN CO., OHIO
DUGAN RUN
SOIL CONSERVATION SERVICE
SHEET 4

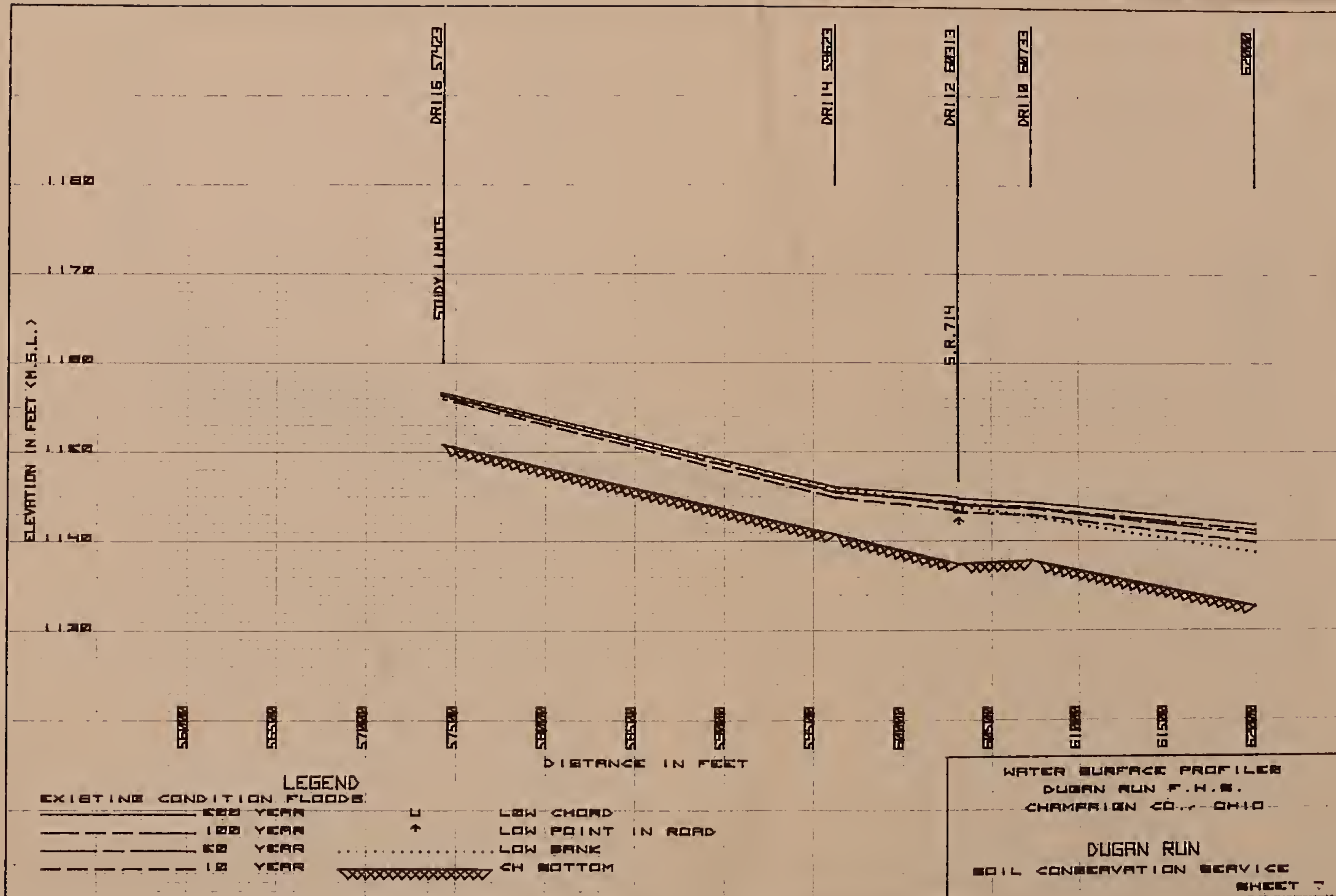


WATER SURFACE PROFILES
DUGAN RUN F.H.S.
CHAMPAIGN CO., OHIO

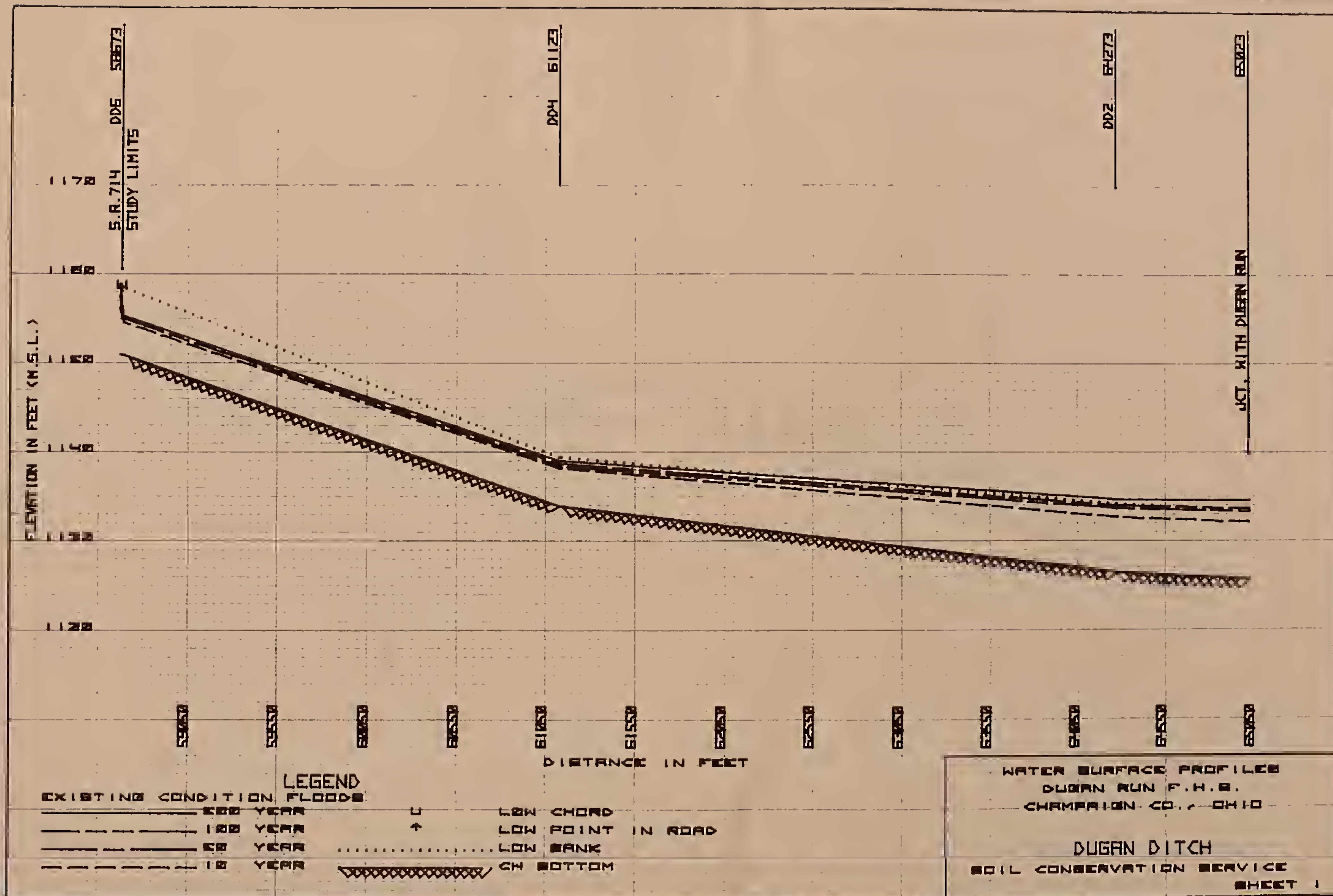
DUGAN RUN
SOIL CONSERVATION SERVICE
SHEET 5

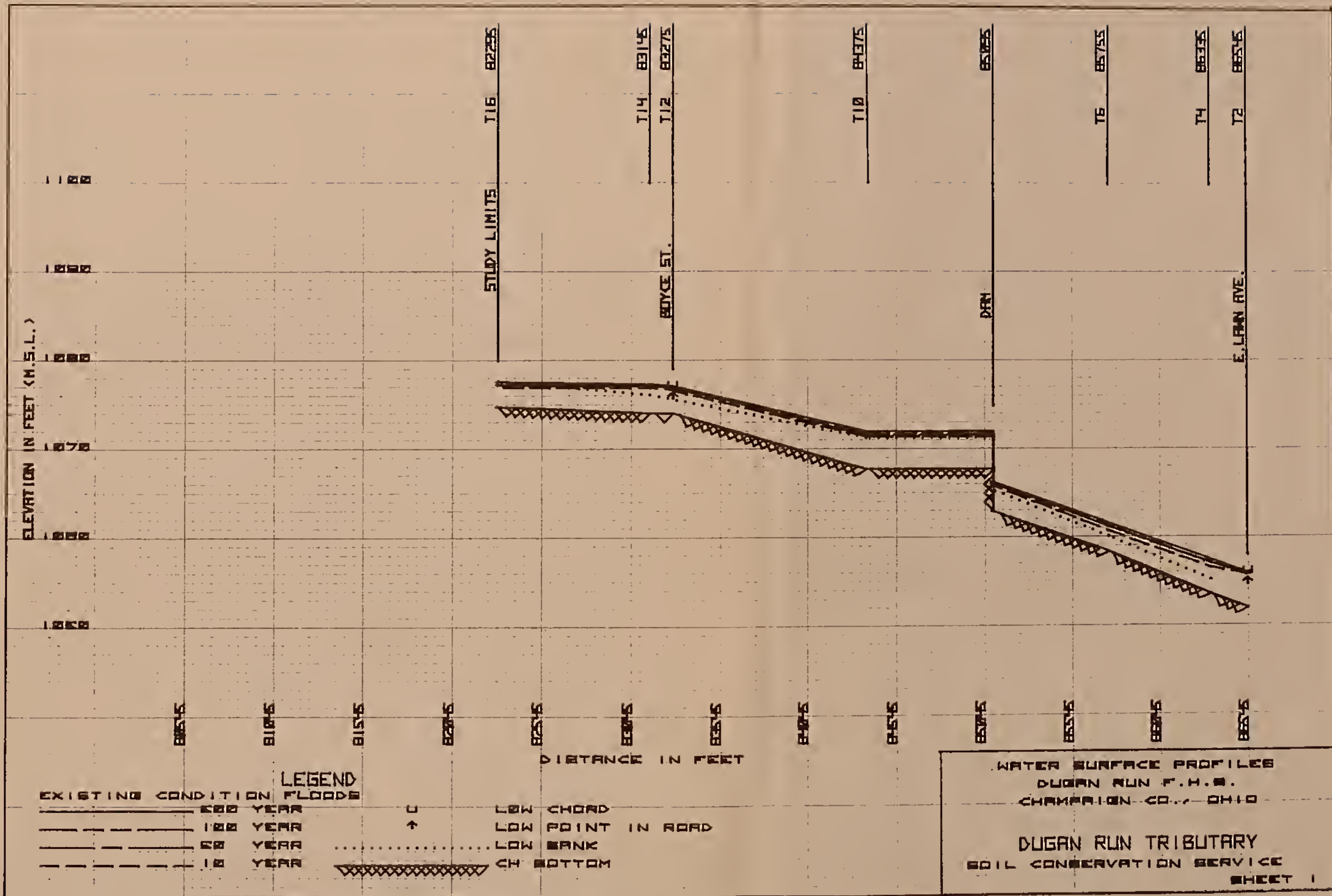


DR102 67178
1170
1160
1150
1140
1130
1120
STONE QUARRY RD.
FARM LANE
ELEVATION IN FEET (M.S.L.)
62500
63000
63500
64000
64500
65000
65500
66000
66500
67000
67500
68000
68500
DISTANCE IN FEET
LEGEND
EXISTING CONDITION FLOODS
500 YEAR
100 YEAR
50 YEAR
10 YEAR
LOW CHORD
LOW POINT IN ROAD
LOW BANK
CH BOTTOM
WATER SURFACE PROFILES
DUGAN RUN F.H.S.
CHAMPAIGN CO., OHIO
DUGAN RUN
SOIL CONSERVATION SERVICE



DR116 57423
DR114 59623
DR112 60313
DR110 60733
62000
STUDY LIMITS
S.R. 714
ELEVATION IN FEET (M.S.L.)
1180
1170
1160
1150
1140
1130
56000
56500
57000
57500
58000
58500
59000
59500
60000
60500
61000
61500
62000
DISTANCE IN FEET
LEGEND
EXISTING CONDITION FLOODS
500 YEAR
100 YEAR
50 YEAR
10 YEAR
LOW CHORD
LOW POINT IN ROAD
LOW BANK
CH BOTTOM
WATER SURFACE PROFILES
DUGAN RUN F.H.S.
CHAMPAIGN CO., OHIO
DUGAN RUN
SOIL CONSERVATION SERVICE
SHEET 7


S.R.714
STUDY LIMITS
DD5 58673
DD4 61123
DD2 64273
JCT. WITH DUGAN RUN
ELEVATION IN FEET (M.S.L.)
1170
1160
1150
1140
1130
1120
DISTANCE IN FEET
LEGEND
EXISTING CONDITION FLOODS
500 YEAR
100 YEAR
50 YEAR
10 YEAR
LOW CHORD
LOW POINT IN ROAD
LOW BANK
CH BOTTOM
WATER SURFACE PROFILES
DUGAN RUN F.H.A.
CHAMPAIGN CO., OHIO
DUGAN DITCH
SOIL CONSERVATION SERVICE
SHEET 1



T16
T14
T12
T10
T6
T4
T2
STUDY LIMITS
BOYCE ST.
DAM
E. LAWN AVE.
ELEVATION IN FEET (M.S.L.)
1100
1090
1080
1070
1060
1050
DISTANCE IN FEET
LEGEND
EXISTING CONDITION FLOODS
500 YEAR
100 YEAR
50 YEAR
10 YEAR
LOW CHORD
LOW POINT IN ROAD
LOW BANK
CH BOTTOM
WATER SURFACE PROFILES
DUGAN RUN F.H.S.
CHAMPAIGN CO., OHIO
DUGAN RUN TRIBUTARY
SOIL CONSERVATION SERVICE
SHEET 1

APPENDIX C

Tabulation of Water Surface Elevation and Floodway Data

Table C-1: Cross Section Locations

Cross Section	Profile Station	Location
Dugan Run		
DR2	1000+00	
DR4	994+50	Muzzy Road
DR6	992+45	
DR8	986+75	
DR10	971+75	
DR12	961+95	Edgewood Avenue
DR14	959+05	
DR16	953+05	R.R. Spur Bridge
DR18	949+05	
DR20	939+05	
DR22	934+05	Abbey Lane
DR24	930+95	
DR26	928+55	Miami Street
DR28	917+78	Conrail
DR30	917+28	
DR32	914+28	Russell Street
DR34	912+23	
DR36	909+93	West Ward Street
DR38	903+93	
DR40	895+93	
DR42	892+93	Main Street
DR44	888+93	
DR46	876+53	
DR48	872+93	Julia Street
DR50	867+98	
DR52	866+58	Bloomfield Avenue
DR54	864+58	
DR56	862+68	Maple Tree Lane
DR58	859+68	
DR60	858+28	
DR62	850+38	
DR64	841+78	Conrail
DR66	841+28	
DR68	840+78	Conrail
DR70	839+78	
DR72	838+88	Dellinger Road
DR74	835+78	
DR76	829+78	
DR78	817+88	
DR80	812+68	Clark Road
DR82	804+38	
DR84	786+38	
DR85	783+28	Farm Lane
DR86	774+48	Conrail

Table C-1: Cross Section Locations

Cross Section	Profile Station	Location
DR88	768+43	
DR90	752+03	
DR92	734+98	
DR94	732+88	Conrail
DR96	728+88	
DR98	720+38	Private Drive
DR100	715+98	
DR102	671+78	
DR103	668+73	Farm Lane
DR104	640+78	
DR106	634+73	Stone Quarry Road
DR108	629+73	
DR110	607+33	
DR112	603+13	S.R. 714
DR114	596+23	
DR116	574+23	Study Limits
Dugan Ditch		
	650+23	Jct. with Dugan Run
DD2	642+73	
DD4	611+23	
DD6	586+73	S.R. 714 & Study Limits
Dugan Run Tributary		
T2	865+45	E. Lawn Avenue
T4	863+35	
T6	857+55	
	850+95	City Park Dam
T10	843+75	
T12	832+75	Boyce Street
T14	831+45	
T16	822+95	Study Limits

Table C-2: Water Surface Elevations and Discharges

Cross Section	Station (FT)	Peak Discharge (CFS) Flood Frequency				Water Surface Elevation (Feet MSL) Flood Frequency			
		10-Year	50-Year	100-Year	500-Year	10-Year	50-Year	100-Year	500-Year
DR2	100000	1300	1980	2190	2980	998.5	999.3	999.5	1000.3
DR6	99245	1300	1980	2190	2980	1004.4	1005.5	1005.8	1006.7
DR8	98675	1300	1980	2190	2980	1005.2	1006.2	1006.5	1007.4
DR10	97175	1300	1980	2190	2980	1011.9	1012.7	1012.9	1013.5
DR14	95905	1300	1980	2190	2980	1015.6	1016.4	1016.6	1017.4
DR18	94905	1300	1980	2190	2980	1016.9	1018.6	1019.2	1021.0
DR20	93905	1300	1980	2190	2980	1021.3	1022.7	1023.1	1024.5
DR24	93095	1300	1980	2190	2980	1024.4	1025.5	1025.7	1026.7
DR30	91728	1090	1770	1970	2700	1029.2	1030.0	1030.1	1030.6
DR34	91223	1090	1770	1970	2700	1031.0	1031.9	1032.1	1032.7
DR38	90393	1090	1770	1970	2700	1034.7	1035.5	1035.7	1036.5
DR40	89593	1090	1770	1970	2700	1039.6	1040.5	1040.8	1041.7
DR44	88893	1040	1480	1620	2120	1042.0	1042.8	1043.1	1044.0
DR46	87653	1040	1480	1620	2120	1044.4	1045.3	1045.5	1046.2
DR50	86798	1090	1480	1620	2120	1047.4	1048.1	1048.2	1048.8
DR54	86458	1040	1480	1620	2120	1049.7	1050.3	1050.5	1051.0
DR58	85968	960	1390	1520	2010	1051.0	1051.7	1051.9	1052.5
DR60	85828	960	1390	1520	2010	1051.2	1051.9	1052.0	1052.7

Table C-2: Water Surface Elevations and Discharges

Cross Section	Station (FT)	Peak Discharge (CFS) Flood Frequency 10-Year	50-Year	100-Year	500-Year	Water Surface Elevation (Feet MSL) Flood Frequency 10-Year	50-Year	100-Year	500-Year
DR62	85038	960	1390	1520	2010	1053.5	1054.6	1055.0	1056.5
DR66	84128	960	1390	1520	2010	1059.7	1060.9	1061.3	1062.6
DR70	83978	960	1390	1520	2010	1060.9	1061.4	1061.6	1062.8
DR74	83578	960	1390	1520	2010	1061.1	1061.6	1061.8	1063.0
DR76	82978	960	1390	1520	2010	1061.7	1062.2	1062.4	1063.3
DR78	81788	960	1390	1520	2010	1063.8	1064.3	1064.3	1064.8
DR82	80438	960	1390	1520	2010	1068.5	1069.1	1069.2	1069.6
DR84	78638	960	1390	1520	2010	1079.6	1080.6	1080.9	1081.8
DR88	76843	920	1340	1470	1990	1089.2	1089.8	1090.0	1090.6
DR90	75203	920	1340	1470	1990	1103.6	1104.9	1105.3	1106.4
DR92	73498	920	1340	1470	1990	1118.8	1120.5	1120.9	1122.2
DR96	72888	900	1310	1430	1940	1125.4	1127.8	1128.4	1129.9
DR100	71598	900	1310	1430	1940	1129.7	1131.9	1132.2	1133.5
DR102	67178	900	1310	1430	1940	1130.7	1132.4	1132.6	1133.8
DR104	64078	860	1390	1560	2170	1134.2	1135.1	1135.4	1136.1
DR108	62973	860	1390	1560	2170	1137.6	1138.7	1139.4	1140.1
DR110	60733	860	1390	1560	2170	1143.0	1143.7	1143.8	1144.4
DR114	59623	860	1390	1560	2170	1144.9	1145.6	1145.6	1146.1

Table C-2: Water Surface Elevations and Discharges

Cross Section	Station (FT)	Peak Discharge (CFS) Flood Frequency				Water Surface Elevation (Feet MSL) Flood Frequency			
		10-Year	50-Year	100-Year	500-Year	10-Year	50-Year	100-Year	500-Year
DR116	57423	860	1390	1560	2170	1155.9	1156.2	1156.3	1156.6
DD2	64273	440	660	720	970	1132.8	1133.8	1134.1	1134.8
DD4	61123	440	660	720	970	1138.2	1138.4	1138.7	1139.0
T4	86335	170	340	380	550	1056.7	1057.2	1057.2	1057.6
T6	85755	170	340	380	550	1060.8	1061.3	1061.4	1061.7
T10	84375	170	340	380	550	1071.5	1071.7	1071.8	1072.1
T14	83145	170	340	380	550	1077.0	1077.2	1077.2	1077.4
T16	82295	170	340	380	550	1077.0	1077.3	1077.3	1077.6

Table C-3: Bridge Data

		FLOOD FREQUENCY															
		10-YEAR				50-YEAR				100-YEAR				500-YEAR			
Cross Section	Station (FT)	Head Water Elev.	Tail Water Elev.	Head Loss (ft)	Q (CFS)	Head Water Elev.	Tail Water Elev.	Head Loss (ft)	Q (CFS)	Head Water Elev.	Tail Water Elev.	Head Loss (ft)	Q (CFS)	Head Water Elev.	Tail Water Elev.	Head Loss (ft)	Q (CFS)
DR4	99450	1002.3	1000.8	1.5	1300	1003.1	1001.5	1.6	1980	1003.3	1001.8	1.5	2190	1004.2	1002.5	1.7	2980
DR12	96195	1015.5	1015.4	0.1	1300	1016.3	1016.2	0.1	1980	1016.6	1016.4	0.2	2190	1017.3	1017.1	0.2	2980
DR16	95305	1016.8	1015.7	1.1	1300	1018.6	1016.5	2.1	1980	1019.1	1016.8	2.3	2190	1020.9	1017.6	3.3	2980
DR22	93405	1023.3	1023.2	0.1	1300	1024.7	1024.6	0.1	1980	1025.1	1024.9	0.2	2190	1026.3	1026.1	0.2	2980
DR28	91778	1029.3	1025.4	3.9	1090	1030.0	1026.3	3.7	1770	1030.2	1026.5	3.7	1970	1030.7	1027.3	3.4	2700
DR32	91428	1030.9	1030.7	0.2	1090	1031.7	1031.5	0.2	1770	1031.9	1031.7	0.2	1970	1032.5	1032.2	0.3	2700
DR36	90993	1031.9	1031.8	0.1	1090	1032.7	1032.5	0.2	1770	1032.8	1032.7	0.1	1970	1033.4	1033.3	0.1	2700
DR42	89293	1041.3	1040.9	0.4	1040	1042.2	1041.9	0.3	1480	1042.5	1042.3	0.2	1620	1043.5	1043.3	0.2	2120
DR48	87293	1046.4	1045.1	1.3	1040	1046.8	1045.9	0.9	1480	1047.0	1046.2	0.8	1620	1047.3	1046.9	0.4	2120
DR52	86658	1048.7	1047.9	0.8	1040	1049.2	1048.6	0.6	1480	1049.3	1048.8	0.5	1620	1049.9	1049.4	0.5	2120
DR56	86268	1050.8	1050.6	0.2	960	1051.4	1051.3	0.1	1390	1051.6	1051.4	0.2	1520	1052.2	1052.0	0.2	2010
DR64	84178	1059.7	1057.0	2.7	960	1060.9	1058.6	2.3	1390	1061.3	1059.1	2.2	1520	1062.6	1060.0	2.6	2010
DR68	84078	1060.9	1059.9	1.0	960	1061.4	1060.9	0.5	1390	1061.6	1061.4	0.2	1520	1062.8	1062.7	0.1	2010
DR72	83888	1061.1	1061.0	0.1	960	1061.5	1061.4	0.1	1390	1061.8	1061.6	0.2	1520	1062.9	1062.8	0.1	2010
DR80	81268	1066.1	1065.1	1.0	960	1066.4	1065.5	0.9	1390	1066.4	1065.6	0.8	1520	1066.7	1066.0	0.7	2010
DR85	78328	1082.5	1081.3	1.2	960	1083.9	1082.4	1.5	1390	1084.3	1082.7	1.6	1520	1085.6	1083.7	1.9	2010

Table C-3: Bridge Data

		FLOOD FREQUENCY															
		10-YEAR				50-YEAR				100-YEAR				500-YEAR			
Cross Section	Station (FT)	Head Water Elev.	Tail Water Elev.	Head Loss (ft)	Q (CFS)	Head Water Elev.	Tail Water Elev.	Head Loss (ft)	Q (CFS)	Head Water Elev.	Tail Water Elev.	Head Loss (ft)	Q (CFS)	Head Water Elev.	Tail Water Elev.	H ad Loss (ft)	Q (CFS)
DR86	77448	1087.0	1086.3	0.7	920	1087.8	1087.6	0.2	1340	1088.1	1087.9	0.2	1470	1089.1	1089.0	0.1	1990
DR94	73288	1122.8	1120.5	2.3	900	1126.1	1122.1	4.0	1310	1126.7	1122.6	4.1	1430	1128.3	1124.0	4.3	1940
DR98	72038	1129.1	1129.1	0.0	900	1131.7	1131.1	0.6	1310	1132.0	1131.6	0.4	1430	1133.4	1133.2	0.2	1940
DR103	66873	1130.8	1130.8	0.0	900	1132.4	1132.4	0.0	1310	1132.7	1132.7	0.0	1430	1133.9	1133.9	0.0	1940
DR106	63473	1134.8	1134.8	0.0	860	1136.0	1135.8	0.2	1390	1138.4	1136.0	2.4	1560	1139.1	1136.7	2.4	2170
DR112	60313	1143.5	1143.3	0.2	860	1144.2	1144.1	0.1	1390	1144.4	1144.2	0.2	1560	1145.0	1144.8	0.2	2170
DD6	58673	1156.1	1154.5	1.6	440	1157.3	1154.9	2.4	660	1157.5	1154.9	2.6	720	1158.8	1155.2	3.6	970
T12	83275	1076.8	1076.6	0.2	170	1077.0	1076.9	0.1	340	1077.1	1077.0	0.1	380	1077.2	1077.1	0.1	550

Table C-4: Floodway Data

Cross Section Number	Profile Station	*------Width in feet----* Left	Right	Total	Area (Sq.Ft.)	Mean Velocity (Ft./Sec.)	Water Surface Elevation	100 Yr. Pres. Cond. Elevation
DR2	100000	45	190	235	666	3.3	1000.5	999.5
DR6	99245	23	91	114	536	4.1	1006.8	1005.8
DR8	98675	24	275	299	1332	1.6	1007.5	1006.5
DR10	97175	63	64	127	523	4.2	1013.9	1012.9
DR14	95905	158	170	328	2310	0.9	1017.6	1016.6
DR18	94905	300	17	317	2345	0.9	1020.2	1019.2
DR20	93905	23	44	67	428	5.1	1024.1	1023.1
DR24	93095	32	96	128	546	4.0	1026.7	1025.7
DR30	91728	21	123	144	451	4.4	1031.1	1030.1
DR34	91223	20	285	305	1273	1.5	1033.1	1032.1
DR38	90393	17	56	73	352	5.6	1036.7	1035.7
DR40	89593	11	60	71	364	5.4	1041.8	1040.8
DR44	88893	32	49	81	395	4.1	1044.1	1043.1
DR46	87653	50	101	151	779	2.1	1046.5	1045.5
DR50	86798	27	18	45	245	6.6	1049.2	1048.2
DR58	85968	70	31	101	451	3.4	1052.9	1051.9
DR60	85828	100	101	201	2110	0.7	1053.0	1052.0
DR62	85038	20	20	40	166	9.2	1056.0	1055.0
DR66	84128	32	101	133	594	2.6	1062.3	1061.3

Table C-4: Floodway Data

Cross Section Number	Profile Station	*------Width in feet----* Left	Right	Total	Area (Sq.Ft.)	Mean Velocity (Ft./Sec.)	Water Surface Elevation	100 Yr. Pres. Cond. Elevation
DR70	83978	86	258	344	2170	0.7	1062.6	1061.6
DR74	83578	40	253	293	1004	1.5	1062.8	1061.8
DR76	82978	124	25	149	594	2.6	1063.4	1062.4
DR78	81788	27	97	124	432	3.5	1065.3	1064.3
DR82	80438	73	23	96	442	3.4	1070.2	1069.2
DR84	78638	27	28	55	308	4.9	1081.9	1080.9
DR88	76843	34	68	102	411	3.6	1091.0	1090.0
DR90	75203	24	25	49	275	5.3	1106.3	1105.3
DR92	73498	32	32	64	265	5.5	1121.9	1120.9
DR96	72888	41	41	82	346	4.1	1129.4	1128.4
DR100	71598	171	25	196	1214	1.2	1133.2	1132.2
DR102	67178	307	155	462	2586	0.6	1133.6	1132.6
DR104	64078	15	409	424	1047	1.5	1136.4	1135.4
DR108	62973	81	95	176	768	2.0	1140.4	1139.4
DR110	60733	190	28	218	724	2.2	1144.8	1143.8
DR114	59623	169	200	369	752	2.1	1146.5	1145.5
DR116	57423	30	234	264	533	2.9	1157.3	1156.3
DD2	64273	65	174	239	540	1.3	1135.1	1134.1
DD4	61123	155	35	190	404	1.8	1139.7	1138.7

Table C-4: Floodway Data

Cross Section Number	Profile Station	*------Width in feet----* Left	Right	Total	Area (Sq.Ft.)	Mean Velocity (Ft./Sec.)	Water Surface Elevation	100 Yr. Pres. Cond. Elevation
T4	86335	5	27	32	100	3.8	1058.2	1057.2
T6	85755	35	35	70	189	2.0	1062.4	1061.4
T10	84375	91	16	107	287	1.3	1072.8	1071.8
T14	83145	61	36	97	216	1.7	1078.2	1077.2
T16	82295	169	84	253	691	0.5	1078.3	1077.3

APPENDIX D

INVESTIGATIONS AND ANALYSES

Survey Procedures

All cross sections used in this report were surveyed by transit and stadia methods. The surveys were obtained in 1980 by SCS, Champaign County, and City of Urbana personnel. The bench level circuits were closed to third order accuracy (error, in feet, less than or equal to 0.05 times the square root of the circuit lengtn, in miles). All elevations are referenced from the National Geodetic Vertical Datum (NGVD) of 1929, formerly referred to as Sea Level Datum of 1929. The location of the elevation refernce marks are indicated on the maps with descriptions included in this appendix.

Hydrology and Hydraulics

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and floodplain areas. Future land use conditions were estimated by the local sponsors considering developmental changes.

Flood discharges were established by valley and structure flood routings computed through use of the SCS watershed model "Project Formulation Hydrology, TR-20" (Reference 10). This program uses the convex method for stream and valley flood routing. The SCS water surface profile program, WSP-2 (step backwater method), was used to determine water surface elevations for the range of discharges utilizing roughness coefficients and surveyed cross sections (Reference 11).

The floodway width was computed using the Floodway Determination Computer Program (SCS TR-64) (Reference 12). The floodway width was determined by decreasing the conveyance (ability of the floodplain to carry water) on each side of the channel by equal amounts, for each valley cross section, until an increased depth of flow of one foot was obtained (See Appendix C).

The floodplain and floodway limits were delineated on contour maps and transposed to the aerial photomosaics using the width of the floodplain and floodway at each cross section and interpolating between cross sections.

The hydraulic analyses for this study were based on unobstructed flow. No consideration was made for bridge or culvert openings blocked by debris, ice, floodplain filling, or other encroachments which could affect the water surface profiles. Computations for this study considered only those features in the floodplain at the time the field surveys were made.

Benchmarks

BM DR4 — Elevation 1004.99
Bronze disc set in top step of northwest (right downstream) wingwall of bridge over Dugan Run on County Road 104 (Muzzys Road). Set by Champaign County Engineer.

BM DR12 — Elevation 1014.36
Bronze disc set in top step on southeast corner of southeast wingwall (left upstream) of bridge over Dugan Run on Edgewood Avenue. Set by Champaign County Engineer.

BM DR26 — Elevation 1027.12
Top of small curved arrow on top of fire hydrant on south side of Miami STreet. 100' east of Glenn Avenue and 80' west of Conrail railroad tracts. Set by City Engineer.

BM DR38 — Elevation 1037.00
Top of steel dowel pin 3.5' above ground on west side of center concrete bridge pier of Dugan Street overpass over Conrail railroad tracks. Set by City Engineer.

BM DR48 — Elevation 1045.67
Chiseled square on northwest corner of northeast concrete wingwall (right upstream) of Julia Avenue concrete culvert on Dugan Run, 17' east of and level with centerline of road.

BM DR72 — Elevation 1060.05
Bronze disc set in southeast concrete wingwall (left downstream) of bridge over Dugan Run on Dellinger Road. Set by Champaign County Engineer.

BM DR80 — Elevation 1066.14

Bronze disc set in southwest concrete wingwall (left downstream) of bridge over Dugan Run on Clark Road. Set by Champaign County Engineer.

BM DR86 — Elevation 1086.00

Chiseled X on northwest corner of southwest concrete abutment (left downstream) of abandoned Erie Railroad Bridge over Dugan Run. 3400' north of Jackson Hill Road crossing.

BM DR94 — Elevation 1125.51

Chiseled square on southeast corner of south concrete headwall (right upstream) of box culvert on Dugan Run on Conrail railroad tracks at Jackson Hill Road overpass. 2' below and 8' south of south rail.

BM DR106 — Elevation 1138.65

Chiseled square on top of northwest concrete wingwall (right downstream) of bridge over Dugan Run on Stone Quarry Road, 1' below road level.

BM DR112 — Elevation 1144.11

Chiseled square on northeast corner of northwest wingwall right downstream) of bridge No. CHP 714 0239, over Dugan Run on State Route 714, 1' below road level.

BM DD6 — Elevation 1158.54

Chiseled square on third step down from top of northeast concrete abutment (right upstream) of bridge No. CHP 714 0126 over Dugan Ditch on State Route 714, 100' south of junction with Hillside Drive and 3' below road level.

BM T2A — <u>Elevation 1059.19</u>

Top of small curved arrow on top of fire hydrant on east side of East Lawn Avenue at intersection of Bloomfield Avenue, 10' north of telephone pole No. CT. Co. 921; 2.6' above ground. Set by City Engineer.

BM T10A — <u>Elevation 1078.12</u>

Top of east corner of concrete flagpole base at front of bath house at city swimming pool; 0.6' above ground.

APPENDIX E

GLOSSARY

GLOSSARY

Benchmark: A permanent physical mark of known elevation.

Conveyance: A measure of the water carrying capacity of the valley and/or channel section.

C.F.S.: Cubic feet per second. Used to describe the amount of flow passing a given point in a stream channel. One cubic foot per second is equivalent to approximately 7.5 gallons per second.

Cross Section: A graph or plot of ground elevation across a stream valley or a portion of it, usually along a line perpendicular to the stream or direction of flow.

Discharge: The rate of flow or volume per unit of time. Usually expressed in cubic feet per second.

Flood: An overflow of lands not normally covered by water and that are useable or used by man. The inundation of the land is temporary and the land is adjacent to or inundated by overlow from a stream or river.

Flood Frequency: The percent chance of occurrence of a flood; e.g., a 100-YR flood frequency would have a one percent chance of being equalled or exceeded in any given year and would be expected to occur on the average of once in 100-years.

Floodplain: The relatively flat area or low lands adjoining the channel of a river, stream, or water course, which has been or may be covered by flood waters.

Floodway: The minimum width of water course required to carry the existing condition 100-year flood when the water surface is raised 1.0 foot.

Headwater Elevations: The elevation of the water surface above mean sea level on the upstream side of the bridge.

Photomosaic: Aerial photographs put together to form the desired photographic coverage of the stream reach.

Profile: A graph or plot of the water surface elevation against distance along a channel. Also termed "flood profile" if drawn for a specific flood or level of flooding.

Recurrence Interval: A statistical expression of the average time between floods equalling or exceeding a given magnitude (see flood frequency).

Subarea: A part of a larger watershed having its own watershed boundaries within or coincident to the main watershed.

Tailwater Elevation: The elevation above mean sea level of the water surface on the downstream side of the bridge.

APPENDIX F

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BIBLIOGRAPHY

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